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# Unveiling the Incidence of Interfirm Collaboration: Evidence from Research and Development Companies in Malaysia

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**Abstract:** Nowadays, interfirm collaboration has become an increasingly popular strategy among many organizations in various industries, in order to remain competitive. Based on the contingency theory, this paper examines the moderating effect of interfirm collaboration on the relationship between Human Resource Management (HRM) practices and organizational performance. Interfirm collaboration refers to the collaboration strategies undertaken by R&D companies, with other companies in similar or diverse functional areas, including R&D, marketing, or manufacturing, to enhance performance. Using data from 64 R&D companies, the hierarchical regression analyses showed that only collaboration in R&D and functional collaboration in manufacturing significantly moderated the relationship between HRM practices and organizational performance. Overall, the results provided partial support in the domain of the contingency theory. These results, however, are limited by the small sample size, which might have produced non-significant findings. Therefore, the generalization should be taken cautiously. Future research with a larger sample size is needed to confirm the findings.

**Keywords:** HRM practices; interfirm collaboration; organizational performance

**JEL classification:** L14, L16, M12

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## Introduction

Rapid technological developments, changing customer needs, shorter product life cycles, higher development costs and increased competition characterize the new business environment (Lorenzoni and Lipparini 1999; Sakakibara 2002; Turpin et al. 2005). Given the multiplicity of challenges in the present environment, Dagnino and Padula (2002) asserted that “coopetition strategies” are very important for organizations to stay ahead. One of the commonly adopted ways to compete and survive among business organizations is by engaging in interfirm collaborations.

Collaboration is the process that helps organizations live on, prosper and adjust to an increasingly complex business environment. The idea of interfirm collaboration is not new (Reuer 2004). However, of late, the reliance on various forms of external relationship has become so noticeable, due to its unprecedented growth. There are a variety of definitions of interfirm collaboration, also termed as “alliance,” “cooperation” and “network” in some studies. For example, Soderlund (2007), who examined strategy implementation in a collaborative context, defines inter-organizational collaboration as “a situation where two or more different organizations collaborate to achieve a strategic intention” (p. 4). Culpan (2008) defined strategic alliances as “a variety of long term equity and non-equity collaborations between firms established to gain a competitive advantage” (p. 98). Gulati (1998) referred to collaboration as “a voluntary arrangement between firms involving exchanges, sharing, or the co-development of products, technologies, or services” (p. 293).

Inter-organizational collaboration in Malaysia, like elsewhere, is rising despite in-

tense competition in almost all the business sectors. Collaboration with the supply chain is a key feature in Malaysia (Chong et al. 2009). The Shared Services Outsourcing (SSO), Business Process Outsourcing (BPO), and Information Technology Outsourcing (ITO) sectors are the new direction in inter-organizational collaborations (Aziati and Juhana 2010). However, one area of collaboration that has invited special attention is in R&D. This is because the R&D sector is expanding immensely, and most importantly R&D activities require knowledge, facilities, and technology, which incur tremendous costs to the respective organizations.

In Malaysia, R&D is a small but vibrant industry because it is the main pillar of the innovation-based knowledge economy. Unlike the traditional economic orientations, that focus on agricultural and industrial outputs, the present economy relies heavily on the country's capacity for knowledge, creativity and innovation to support growth. Various fiscal and non-fiscal incentives are provided by the government to support and strengthen the R&D activities (Ministry of Science, Technology & Innovation - MOSTI 2007). Despite its importance and lackluster performance, not much is known about this industry. Like other business firms in an emerging sector, interfirm collaboration is also expected to be employed among the many R&D firms as one of their strategic approaches to remain competitive. Empirical studies concerning the relationship between interfirm collaboration and organizational performance within the context of R&D in Malaysia are rare.

Furthermore, empirical collaboration studies that incorporate HRM concerns are very limited. In fact, many interfirm collaboration studies have been done in countries such as Netherlands (Belderbos et al. 2004),

United States (Campart and Pfister 2007; Shrader 2001), Taiwan (Hsu and Tai 2009) and Canada (Woiceshyn and Hartel 1996). Several researchers have highlighted the role of HRM to facilitate the collaboration process as well as to create supportive collaboration culture (Lajara et al. 2002; Lorange 1996; Schuler 2001). Thus, understanding the nature of interfirm collaboration and the management of people involved in the collaborative relationships is vital for organizational management and public policy to stimulate the R&D sector. Specifically, this paper aims to examine the moderating effect of interfirm collaboration on the relationship between HRM practices and organizational performance.

## Literature Review

Firms are likely to vary in the strategies they choose to achieve their objectives. Some firms prefer to work on their own, while others prefer to collaborate with their external counterparts. The advantages of collaborating with different partners, or in various functional areas, have been highlighted in previous studies. With regards to the types of partners, several researchers reported that collaborating with their suppliers and customers tends to improve the turnover of the existing products, the operational efficiency of the production process and the firm's innovation. This is because such collaborations enable them to get relevant information regarding the current market trends of customers, and low input materials from suppliers. Meanwhile, collaborating with universities and research institutes allows for the creation of knowledge and ideas relating to the development of new products or technologies (Asakawa et al. 2010; Belderbos et al. 2004; and Faems et al. 2005; Zhou et al. 2013).

Besides collaborations with different types of partners, previous studies have also examined the effect of collaboration with different functional areas. Forming alliances with downstream partners, such as marketing, manufacturing and finance companies provides access to marketing expertise, production facilities, operational knowledge and financing that are all critical to the successful development and commercialization of products (Belderbos et al. 2006, Powell et al. 1996, Woiceshyn and Hartel 1996).

Although the positive contribution of collaboration to performance has been recognized by previous research, there are also studies which have highlighted the vice-versa effects of such relationships. For example, Belderbos et al. (2006) found that when collaboration between a supplier and either a university or competitor are used simultaneously, productivity growth tends to weaken due to conflicting objectives. This is because suppliers often focus on cost reductions whereas universities and competitors incline more toward engaging in aggressive innovation that needs a generous budget. Also, working simultaneously with a competitor may cause spillovers from the university, which may leak to non-collaborating competitors. In line with this idea, Silverman and Baum (2002) pointed out that alliances with established potential rivals tend to experience weaker performance, as these alliances are hard to manage and likely to encourage more of a learning race than a sharing behavior. Although many studies have shown the positive effect of functional collaborations on organizational performance, Campart and Pfister (2007) reported that collaboration in R&D tends to generate greater abnormal returns than collaborations in production, marketing or distribution. In a different study, Sampson (2007) emphasized that firms ben-

enefit more from alliances when they have some, but not all, of the technological capabilities common to their partners. This is because too much similarity means that the partners have less to learn from each other. Alternatively, this study also suggested that some diversity between partners is good for innovation, however when the partners are too diverse, the firms have difficulty learning from their partners.

The previous highlighted studies have basically indicated the difficulties that collaboration may imply, requiring complementary resources and skills to create synergy between the participating firms. In this case, there are scholars who have emphasized the critical role of Human Resource Management (HRM) as an enabler to create a supportive environment for collaboration, and to ensure the success of the collaboration efforts. Wright et al. (1999) described HRM practices as the organizational activities directed at managing the pool of human capital, and ensuring that the capital is employed towards the fulfillment of the organizational goals. HRM has also been referred to as Strategic HRM (SHRM) by some scholars. For example, Mathis and Jackson (1985) defined HRM as “the strategic planning and management of human resources for an organization ... HRM is more broadly focused and strategic in nature” (pg. 3-4). Similarly, Beer et al. (1984) consider HRM to be similar to SHRM, as they wrote “we view HRM from a strategic perspective” (pg. 13). Scholars who described SHRM based on focused strategies believe that HRM and SHRM are the same, since the implementation of HRM practices is always based on the requirement of the strategy that has been outlined by the organization (Kazmi and Ahmad 2001). In other words, HRM is judged based on how well it contributes, and

it is not free of strategy. Therefore, in this study, HRM is considered similar to SHRM.

Schuler and Jackson (1987) argued that different strategies require different employee behavior to support its implementation and thus, entails different type of human resource practices to cultivate the needed behavior. The creation of behavior relies on the practices that enable the development of employees’ knowledge, skills and motivation. When employees are equipped with the right knowledge, skills and motivation, then the right behavior will be created. They proposed a typology of HRM practices which includes planning, staffing, appraising, compensation, training and development to facilitate the creation of employees’ desirable behavior, based on competitive strategies. Recently, Schuler and Jackson (2014) extended their earlier model by incorporating many additional aspects of a firm’s internal and external environments, to explain how HRM practices can facilitate companies to attain effectiveness through addressing important stakeholders concerns.

The earlier model “HRM practice menus” (Schuler and Jackson 1987) is used as a general guideline to choose the relevant HRM practices as well as the measurements. The present study has also included teamwork and employee participation as important practices to develop behavior that will facilitate organizational performance enhancement (Chow and Liu 2007; Mudambi et al. 2007). According to Heavey et al. (2013), teamwork and employee participation are part of HRM practices. For R&D companies employing interfirm collaboration strategies, the desired employees’ behavior includes the kind that can lead to cooperation and innovation.

Empirical collaboration studies that incorporate HRM concerns are very limited. HRM practices, particularly staffing, appraising, compensation, training and development have been considered important in R&D companies. Staffing refers to the process of acquiring, deploying and retaining a sufficient workforce to facilitate the organization to attain its objectives (Heinemen et al. 2015). In R&D companies, hiring is an important process to acquire and secure the talents of R&D professionals (Huang and Lin 2006). The recruitment process is required to screen candidates who can fit-in with what the company can offer, as not all companies are able to provide adequate opportunities for scientists and engineers to pursue their individual research interests (Treen 2001). In addition, Farris and Cordero (2002) found that many present R&D organizations are more interested in acquiring scientists and engineers with varied skills, in order to respond effectively to increasing customers' needs. For companies with a collaborative strategy, previous studies suggest that the employees involved in the collaborative effort must not only be competent as individuals who can perform their own work, but also be able to work together with different people to effect the cooperative venture (Lajara et al. 2003). McGee et al. (1995) posited that employees assigned to an alliance or other cooperative relationship should be experts in the function or activity that serves as the basis for the cooperation, such as R&D, marketing, or manufacturing. According to Lorange (1996), these employees must have the ability to promote the transfer of know-how, as well as provide sufficient feedback to their respective parent organizations.

Reward or compensation refers to remuneration, pay, and/or incentives used to motivate employees (Milkovich and Newman

2005). Rewarding employees appropriately, especially between technical and non-technical employees in R&D companies is important, to avoid high turnover among the core employees (Badawy 1988). Previous studies have shown that not all types of R&D professionals can be motivated by the same rewards. Some of them are motivated mostly by extrinsic rewards (Lee and Wong 2006), while others are inspired by both extrinsic and intrinsic rewards (Chen et al. 1999). Kim and Oh's (2002) study indicated that R&D personnel in applied and commercial research prefer to have team based rewards, whereas their counterparts in basic research prefer to have some sort of fixed compensation. For R&D companies that engage in collaborative relationships, determining the right compensation for their employees who are involved in the collaborative efforts is highly critical, as they are expected to have a more complex task than their colleagues who are in different positions (Sunoo 1995). Besides, reward can be used as a means to encourage organizational learning, by explicitly rewarding knowledge seeking and knowledge sharing behavior (Pucik 1988) especially when collaboration is adopted to gain access to critical information or knowledge.

Appraisal is a formal system of reviewing and assessing individual job related performance (Mondy and Martocchio 2016). This function of HRM is crucial because ineffective performance appraisal practice may impede strategy implementation and organizational performance (Pella et al. 2013). In the R&D context, appraisal helps to ensure the R&D professionals have the right skills, knowledge and behavior to develop their creative potential. Kim (1997) found that different types of R&D professionals desire different kinds of career development path, in which some prefer to pursue a technical path,

while others choose to climb the managerial ladder. In this regard, the appraisal system is important to identify individual competencies and to serve as a guide for appropriate development initiatives. Further, Treen (2001) posited that start-ups, which commonly have a limited financial capability, are more likely to be unable to allow scientists to work alone on one research project, compared to mature companies, thus, they rely on an appraisal system that can promote fairness, to enhance the individuals' motivation in a group work orientation. In R&D companies with a collaboration relationship, performance appraisal is crucial to ensure the respective employees have the right skills, knowledge and behavior to perform their work with the collaborating partners effectively.

Training and development practices aim to create or develop skills, knowledge and attitudes within employees, so that they will be able to carry out their current as well as future work responsibilities effectively (Desimone et al. 2002). Wang and Horng (2002) proved in their study that when R&D employees attend creative problem solving training, their R&D performance improves. Further, a study by Lee et al. (2005) suggested more precautions are needed when identifying the right training and development programs. Their findings show that allowing R&D professionals to attend non-technical management training programs impedes their concentration on R&D activities and therefore, reduces their actual R&D outcomes. Similarly, Parboteeah et al. (2005) argued that not all types of development programs can lead to organizational success. Besides that, the shift from continuous innovation (3<sup>rd</sup> generation R&D), to discontinuous innovation (4<sup>th</sup> generation R&D), demands that the present R&D professionals can develop not only within their technical specialties, but

also beyond their specialized expertise (Miller and Morris 1999). Consequently, this means that the development of R&D professionals must cover matters both within and beyond their current technical specialties, to fulfill their immediate as well as future job needs. For companies with collaborative relationships, training and development is important to promote cultural convergence (Lajara et al. 2003), clarify the different cultures and objectives of the alliance (Sunoo 1995), and develop competencies and behavior that are consistent with the businesses' requirements (Schuler 2001). Pucik (1988) argued that in order to accumulate invisible assets from a partner, training can be used to educate employees with various types of knowledge, such as collaboration management, trust, team-building and cross-cultural communication.

Participation is defined as a process of allowing superiors' influence to be shared with individuals at lower levels (Wagner 1994). Employees' participation practice aims to get the employees involved in goal setting, problem solving, or decision making, by permitting them greater autonomy and control over their work and workplace. It also gives a signal to the employees that their management has a great deal of trust in them (Tzafrir 2005). Amabile (1998) asserted that employees tend to produce more creative work when they perceive themselves to have options on how to perform their tasks. In R&D companies with collaboration relationships, practicing employee participation, such as by allowing employees to make their own decisions about how to handle their work, is expected to reduce some complexities, especially when the respective employees have to deal with employees from companies of a different nature (e.g. manufacturing or marketing).

Teamwork practices aim to encourage employees to work with more than one person in order to compensate for any lack of knowledge and skills when they work alone. Proehl (1997) defined a team as a group of people with complementary skills dedicated to achieving a common purpose. Team members may consist of people from different disciplines/functional areas, organizations and/or geographical locations. This, in turn, will open up incredible opportunities for creative potential (Wing 2001). For R&D companies that engage in collaborative relationships, teamwork allows for the utilization of different knowledge and expertise embedded in the team's members, to create new knowledge (Laursen and Foss 2003). Emphasizing teamwork practices can also build team spirit among the employees of both collaborating companies, encouraging them to put a high value on achieving objectives and not creating conflicts. This, consequently will help to accelerate the creation and production of customer driven products.

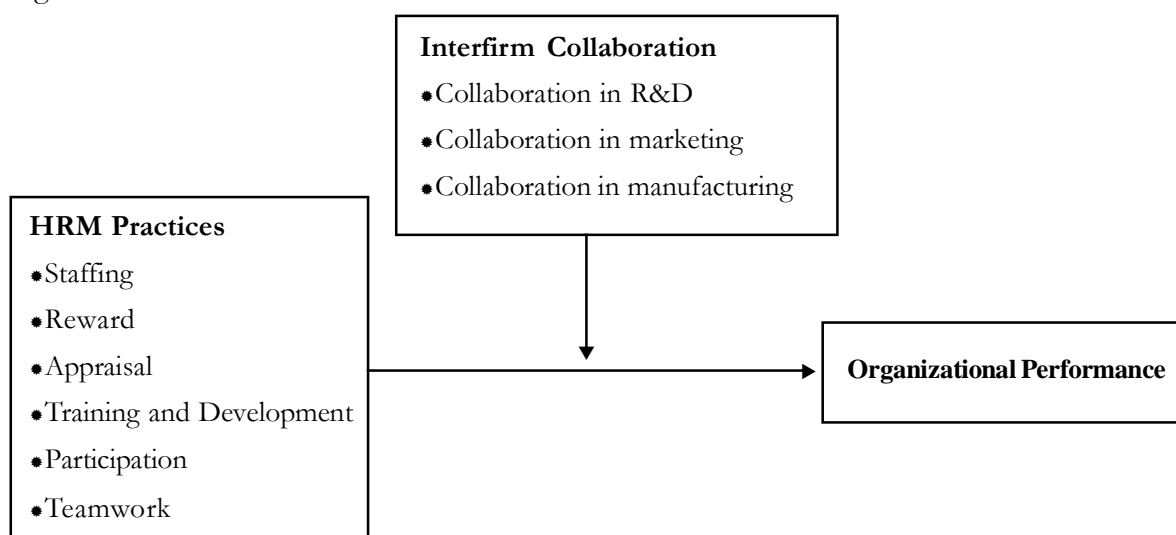
This study takes the view of the contingency theory, which holds that organizational performance is a function of the goodness of fit between HRM practices and other aspects of the organization. In other words, there must be a good fit for organizations to achieve outstanding performance (Delery and Doty 1996; Pennings 1987; Schuler and Jackson 1987). Venkatraman (1989) identified six different perspectives of fit in strategy research: Fit as moderation, fit as mediation, fit as matching, fit as co-variation, fit as gestalts and fit as profile deviation. The fit as moderation perspective specifies that the impact that a predictor variable has on a criterion variable is dependent on the level of a third variable (moderator). The moderator may affect the strength or direction of the

relation between a predictor variable and a criterion variable.

In this study, the effect of HRM practices on performance is expected to be stronger when R&D companies engage in inter-firm collaborations, than when they do not. For instance, when R&D companies collaborate with other R&D counterparts, it is important to cultivate a sharing behavior among the scientists or engineers of both companies, in order to encourage knowledge exchanges and reduce competition sentiments. Meanwhile, unwanted behavior, for example behavior that leads to unnecessary information leaking, should be avoided by having a formal monitoring system. When R&D companies collaborate with manufacturing or marketing companies, knowledge about their products and markets or customers, the ability to work in diverse teams and good communication skills are important competencies to ensure the desired research output can be manufactured and marketed effectively. Managing employees who are involved in a collaboration process is more difficult than managing those who work in a single company, as their work requirements and work context are more challenging and complex (Pucik 1988 and Sunoo 1995). In this regard, HRM practices, particularly staffing, appraisal, training, rewards, teamwork and employees' participation, are expected to be able to facilitate the collaboration process.

In short, the aforementioned discussion asserts that for R&D companies with collaborative strategies to enhance their performance, they have to implement certain HRM practices that can support their collaborative efforts. However, the same HRM practices might not be necessary for R&D companies without such a strategy. In other words, performance is expected to be enhanced by a fit

Figure 1. Theoretical Framework



between the HRM practices and the collaboration strategy. The effect of HRM practices on organizational performance is expected to be stronger for R&D companies with a collaboration strategy than for those without such a strategy.

Consistent with these arguments, the following hypotheses on the moderating effect of interfirm collaboration on the relationship between HRM practices and firm performance are articulated:

*H<sub>1</sub>: Collaboration in R&D significantly moderates the relationship between HRM practices and organizational performance.*

*H<sub>2</sub>: Collaboration in marketing significantly moderates the relationship between HRM practices and organizational performance.*

*H<sub>3</sub>: Collaboration in manufacturing significantly moderates the relationship between HRM practices and organizational performance.*

## Methods

The companies were selected through a systematic sampling method from a list of

R&D companies provided by the Companies Commission of Malaysia. Based on the list gathered, the actual number of R&D companies in the population is 273. To identify the sample, every 2<sup>nd</sup> organization listed was selected to be included as respondents for this research. In the first round of selecting, 136 companies were chosen. Then the unselected companies were taken out from the original list and the second list was developed. Using the second company's list, every 2<sup>nd</sup> company listed was selected to complete the required number of companies that was 178 needed for the present research. Finally, a total of 178 questionnaires were distributed. The population for this study consisted of all the R&D organizations in Malaysia. Organizations involved in R&D can be categorized into two types: Government agencies and non-government agencies. For the purpose of the present study, only the non-government agencies are included. This is because the HRM practices for all government agencies are regulated by the Public Service Department (PSD) and consequently there may not be much variation in their practices of hu-



man resources' management. R&D organizations, in this study, refer to those whose core activity is conducting research for the development of new products and/or processes. Each company was given two sets of questionnaires, to be completed by the R&D manager and the HR manager. The R&D managers were chosen to provide information on their business's strategy and overall organizational performance. They were chosen because they have the best vantage point for viewing both the operational and business systems. On the other hand, the HR managers were chosen to supply related information about the human resources' management strategy. They were chosen since they are considered to be the most knowledgeable in-

dividuals about the company's HR practices and policies. Two informants were used in order to get more accurate and comprehensive information. Such an approach has been used by Shih and Chiang (2005) and Youndt et al. (1996). The informants from each company were given their respective questionnaires with the same code to avoid them getting mixing up with other companies.

A total of 178 sets of questionnaires were distributed to the R&D and HR managers in the R&D organizations in Malaysia. Of these, only 64 sets (each set comprised complete responses from both R&D and HRM managers) were returned, yielding a response rate of  $(64/178) \times 100 = 36$  percent. The non-responses were mainly due to either the

Table 1. **Measurements for HRM Practices**

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Staffing practice was measured using a twelve-item scale. Seven items were developed based on Schuler's (1987) works on acquisition criteria, four items were adapted from Huang (2001) on career path (broad or narrow) and acquisition source (external or internal), five items related to the acquisition sources used by the organization were adapted from Huang and Lin (2006).

Reward practice was assessed using a fifteen-item scale. Four items were developed based on Schuler's (1987) typology on incentives (extrinsic or intrinsic and group or individual) while six items were adapted from Huang (2001) on base pay (higher or lower) and equity (external or internal); as well as from Shih and Chiang (2005) on compensation based (performance or rank). Five additional items were developed based on the conceptual work of Ramlall (2003) on the idea of providing incentives to align organizational behavior (through culture and objectives) with business strategy and investment

Performance appraisal practice was assessed using an eight-item scale. Four items relating to the assessment criteria: Result-based or behavioral based and group based or individual-based were adapted from Chen and Huang (2009) and Huang (2001), consecutively. Two items in relation to decisions on promotion (performance-based or seniority-based) were adapted from Shih and Chiang (2005). Finally, two items measuring performance appraisers (multiple or single) were developed based on Schuler and Jackson's (1987) typology on performance management.

Training and development practice was assessed using a six-item scale. All items were developed based on Schuler's (1987) typology on "training and development" (short term or long term and narrow application or broad application).

Participation practice was assessed using a four-item scale. These items were adapted from Delery and Doty (1996).

Teamwork practice was assessed using a four-item scale. All items were adapted from Michie and Sheehan-Quinn (2001).

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persons being contacted claiming that the companies they worked for were not R&D companies, or the respondents cancelled their participation at the last minute, despite a prior agreement having been made through phone calls, because of the time constraints posed by the volatile nature of the R&D industry.

The predictor, HRM practices, was defined as people related practices employed by an organization to attract, deploy, develop and reward their R&D professionals. Respondents were asked to state how accurately the statements described their company's HRM practices. Schuler's (1987) "HRM practice menus" were used as they provided a wide ranging choice of practices which could be utilized to develop appropriate HR behavior. In addition, this typology has been widely employed in studies attempting to find links between HRM strategies and business strategies (e.g. Chang and Chen 2002; Huang 1999; Shih and Chiang 2005).

In order to link the needed behavior with the firm strategy, several decisions regarding the HRM practices were made. R&D industry in Malaysia is still a relatively new and immature industry compared to other industries in the country. The Knowledge Based Economy Master Plan (KBEMP) is one of the major initiatives that recognized the critical role of private sector to spearhead the knowledge economy through R&D efforts (KBEMP: Executive Summary 2001-2010). As a result, a high number of items in relation to HRM practices were adapted from various sources (with their works based on Schuler's typology), as well as being developed, in order to ensure comprehensive practices can be captured. The pool item was then screened by expert judges (university professors) familiar with interfirm collaborations, HRM and performance literature. Suggestions for improvements were solicited from

the expert judges and their suggestions were incorporated before the actual survey was conducted. All together, the HRM practices were measured using 49 items with a seven-point Likert scale, ranging from 1 = "very inaccurate" to 7 = "very accurate". The respondents were asked to respond to the items by indicating their level of agreement using the selected scale. This category of scale was chosen because based on Hair et al. (2007), respondents usually avoid the extremes when responding to any items. So if there are seven scale responses, the instrument actually only has a five-point scale, because it is highly unlikely the respondents will select the extremes of the scale (i.e. 1 or 7).

The moderating variable, interfirm collaboration, was conceptualized as the nature of a firm's inter-relationships. Specifically, it refers to the various types of relationship, including collaboration in the R&D, marketing or manufacturing areas (Woiceshyn and Hartel 1996). Interfirm collaboration was dummy coded as 1, if the firm reported an engagement in any type of collaborative relationship, and 0 if no engagement was reported. The dependent variable, firm performance, was examined using profitability or Return On Sales (ROS). This particular indicator was chosen because profitability is a primary goal of firms engaging in collaborative relationships (Shrader 2001). In essence, the R&D firms with strategic partners will have various advantages, not only in sharing technology and expertise but also in reducing their costs and risk, which allows them to earn higher profit margins at a faster rate than when they operate alone.

In order to confirm the dimensionality of HRM practices, a principal component factor analysis with varimax rotation was used. The analysis produced 4 factors with eigenvalues greater than 1 and explained

Table 2. Results of Factor Analysis on HRM Practices

	F1	F2	F3	F4
<b>Factor 1: Reward</b>				
This company offers group based incentives (e.g. gain-sharing, profit-sharing, stock option) to R&D staffs.	0.07	0.05	<u>0.91</u>	0.01
This company offers individual based incentives to R&D staff (e.g. commissions for individuals who bring in R&D projects, cash bonuses for individuals who achieve work objectives).	0.13	0.03	<u>0.90</u>	0.09
<b>Factor 2: Training and Development</b>				
This company provides extensive developmental programs to enhance R&D staff's competency for future needs.	-0.08	<u>0.79</u>	0.01	0.17
Currently, each R&D staff is required to attend training within his/her specialty.	-0.02	<u>0.87</u>	-0.01	0.16
Currently, each R&D staff is required to attend training beyond his/her specialty.	0.08	<u>0.82</u>	0.09	-0.08
<b>Factor 3: Participation</b>				
In this company, R&D staffs' voices are valued by the organization.	0.02	0.04	0.07	<u>0.88</u>
In this company, superiors keep open communications with R&D staff.	0.19	0.16	0.04	<u>0.83</u>
<b>Factor 4: Teamwork</b>				
In this company, R&D staff are encouraged to work as a team.	<u>0.80</u>	0.08	0.17	0.20
Majority of the research projects done in this company require R&D staff to work as a team.	<u>0.89</u>	-0.15	0.09	0.11
In this company, R&D staff are involved in formal and informal work teams.	<u>0.92</u>	0.04	0.00	-0.06
Eigenvalues	2.78	2.21	1.48	1.27
Percentage Variance Explained	27.87	22.10	14.82	12.71
Total Variance Explained	77.49			
KMO	0.63			
Bartlett's test of Sphericity	228.89***			

77.49 percent of the variance. Table 2 displays the results of the factor analysis on HRM practices. Cronbach's alpha for the three HRM practices (i.e. teamwork, development, reward) were above the suggested threshold of 0.7, except for participation which was slightly below (Hair et al. 2006). Table 3 summarizes the reliability coefficients of the measures.

Table 3. **Reliability Coefficients for the Variables in the Study**

Variables	Number of Items	Cronbach's Alpha
Teamwork	3	0.85
Development	3	0.77
Reward	2	0.82
Participation	2	0.69

Note: N = 64

Table 4 shows the values of skew and kurtosis for the HRM practices. These values were calculated to determine the normality of the distribution of the scores of these variables. To test whether the distribution's skew deviates significantly from that of a normal distribution, the value for the skew was divided by the standard error of the skew. This yielded a z-score which was later compared against the critical value of  $\pm 1.96$  (Hair et al. 2006). The skew was considered significant if the calculated value exceeded the critical value. A similar procedure was conducted for kurtosis. As indicated in Table 3, all the HRM practices (teamwork, reward, development and participation) had z-values for both the skew and kurtosis of below the critical value, as suggested by Hair et al. (2006). However, the value for the skew was found to be significant for the variable, performance (skew = -2.030, kurtosis = 0.363).

Table 4. **Descriptive Statistics of the HRM practices and Performance**

Variables	Minimum	Maximum	Mean (M)	Standard Deviations (SD)	Normality	
					ZSkewness	ZKurtosis
Teamwork	5.00	7.00	5.90	0.64	0.75	1.46
Reward	5.00	7.00	5.77	0.62	0.63	-1.55
T&D	5.00	7.00	5.79	0.53	0.60	-0.84
Participation	4.50	7.00	5.72	0.48	1.07	0.00
Performance	-0.47	0.32	0.02	0.17	-2.03	0.36

Note: N = 64

Table 4.a. **Log transformation of variable Performance**

Variables	Minimum	Maximum	Mean (M)	Standard Deviations (SD)	Normality	
					ZSkewness	ZKurtosis
Log performance	0.00	0.25	0.12	0.06	0.92	-0.40

Note: N = 64

This means that the variable, performance, was significantly different from those in a normal distribution. According to Hair et al. (2006), to fix the normality problems, a reflect log transformation should be applied. Specifically, a new variable, that is “log performance,” was produced for the performance. Again, following the same general procedures, the values for both the skew (0.920) and kurtosis (-0.400) of the transformed scores were found to be not significantly different to those of a normal distribution. Thus, the transformed variable was used in the correlation and regression analyses. The transformed scores are shown in Table 4.a.

## Results

Table 5 shows the descriptive statistics for the different types of interfirm collaboration. It is indicated that collaboration in R&D appears to be the most frequent form of collaboration, with 64.1 percent of firms indicating they are engaged in this type of collaboration, followed by collaborations in manufacturing (39.1%) and marketing (34.4%).

Hierarchical regression analyses were conducted to assess the extent to which the interaction effect of HRM practices and an

interfirm collaboration strategy has on organizational performance. Table 6 shows the results of the regression analyses. The respondents’ demographic variables, such as their organization’s size and age were the control variables. The general procedure for testing the moderating effects was to enter the sets of predictors into the regression equation in the following order. The control variables were entered in the first step, in order to discover any unique variance explained by these variables. Then, in the second step, the HRM practices were entered. The moderating variable, collaboration, was entered in the third step. Finally, in the fourth step, the interaction terms obtained by multiplying the moderator variables by the independent variables were added. A significant interaction term would be considered as an indication of a moderating effect. Collaboration with another firm was not tested since it is a constant. Four separate hierarchical regression analyses were performed, in which one collaboration strategy type was tested with four HRM practices in each analysis.

The results from the hierarchical regression analyses indicated that only collaboration in R&D and collaboration in manufacturing significantly moderated the relationship between HRM practices and organizational performance. Of these two, collaboration in

Table 5. **Descriptive Statistics For Different Interfirm Collaboration Types**

Collaboration Types	No Collaboration	Collaboration
Collaboration in R&D	23 (35.9%)	41 (64.1%)
Collaboration in marketing	42 (65.6%)	22 (34.4%)
Collaboration in manufacturing	39 (60.9%)	25 (39.1%)

Table 6. Effect of HRM Practices and Collaboration Strategy on Organizational Performance

Variables	Collaboration in R&D				Collaboration in Marketing				Collaboration in Manufacturing			
	$\beta$	R <sup>2</sup>	$\Delta R^2$	$\Delta F$	$\beta$	R <sup>2</sup>	$\Delta R^2$	$\Delta F$	$\beta$	R <sup>2</sup>	$\Delta R^2$	$\Delta F$
<b>Step1 Control</b>		0.02	0.02	0.45		0.02	0.02	0.45		0.02	0.02	0.45
Constant	0.11				0.11				0.11			
Age	0.00				0.00				0.00			
Size												
Small	-0.01				-0.01				-0.01			
Medium	-0.02				-0.02				-0.02			
<b>Step2 HRM Practices</b>		0.24	0.22	3.99**		0.24	0.22	3.99**		0.24	0.21	3.99**
Teamwork	0.59				0.14				-0.15			
Development	0.50				-0.37*				-0.45**			
Reward	0.00				0.15				0.22			
Participation	-0.05				0.19				0.58**			
<b>Step3 Strategy</b>		0.24	0.11	0.00		0.26	0.02	1.60		0.24	0.00	0.51
Collaboration	-0.05				0.14				-0.13			
<b>Step4 HRM practices X strategy</b>		0.37	0.13	2.56*		0.27	0.01	0.21		0.38	0.14	2.79**
CollaborationX teamwork	-0.54				-0.08				0.32†			
CollaborationX development	-0.91*				0.06				0.02			
CollaborationX Reward	0.29				0.11				0.01			
CollaborationX participation	0.36				0.04				-0.50**			

Note: †p<0.10, \*p<0.05, \*\*p<0.01

manufacturing showed a stronger moderating effect on organizational performance than collaboration in R&D. Specifically, the interaction between collaboration in manufacturing and teamwork was positively related to organizational performance ( $\beta = 0.32$ ,  $p < 0.10$ ), however, the interaction between the

same collaboration type and participation was negatively related to performance ( $\beta = -0.50$ ,  $p < 0.01$ ). The present results also show that the interaction between development practice and collaboration in R&D was negatively related to organizational performance ( $\beta = -0.91$ ,  $p < 0.05$ ).

## Discussions, Implications, and Future Research Directions

In general, the results of the present study revealed that Malaysian R&D firms have pursued a broad spectrum of collaboration strategies. The diversity of strategies reflect the heterogeneity of the fields, backgrounds and goals. Still, several key collaboration strategies have emerged in the R&D industry. One important strategy has been to collaborate with various functional areas, such as: R&D, manufacturing and marketing.

This study found that only collaborations with manufacturing and collaboration in R&D have a significant moderating effect on the relationship between HRM practices and organizational performance. Collaboration with marketing did not show any significant moderation effect.

These results contradict many of the previous research findings, which investigated the strategy's moderating effect on similar relationships (Boxall and Purcell 2000; Chang and Huang 2005; Richard and Johnson 2001; Youndt et al. 1996). The possible explanation for getting such results could be because when R&D firms employ a strategy of collaborating with other firms in manufacturing, practicing teamwork becomes highly critical in order to ensure the knowledge about manufacturing can be acquired, shared, and learned, so that the ideas for designing new products, that are both highly manufacturable and marketable, and can be utilized and integrated during the product's design phase. Also, the dependence on teamwork practices becomes more important when firms collaborate in manufacturing functions than when they do not, to facilitate the sharing of knowledge and ideas among the workers of all the collaborating companies, to create new knowledge for modifying existing products so that the

products can still be relevant for customers. However, due to the nature of interfirm relationships, which are usually more complex than when a firm operates on its own, it could be a drawback to place too much emphasis on employee participation practices.

Often interfirm collaborations have an inherent issue of conflicts arising from the different goals of the collaborating participants (Winkler 2006). In this regard, when R&D firms decide to collaborate with other firms in manufacturing, allowing employee participation would probably create a conflict of work interests, as scientists or engineers from the R&D firms are more interested in their research, while the employees from the collaborating manufacturing partners' concerns are more focused on developing the product. Thus, in the situation where interfirm collaboration is employed, particularly in collaborations between different functional areas, practicing employee participation would probably make the implementation of the necessary work difficult i.e. a consensus and an effective decision would be hard to achieve, as the process of making decisions might be influenced by people's work interests.

The present results also showed that of the four interaction terms, only the interaction between development practice and collaboration in R&D was found to affect organizational performance significantly. However, it suggested that employing training and development practice will reduce organizational performance when the strategy of collaboration in R&D is adopted. The possible explanation could be related to higher risk for collaboration in highly uncertain R&D projects due to the possible leaks out of involuntary know how to the collaborating partners who are also competitors in output market (Veugelers and Cassiman 2005). The de-

development practice which supposedly provides platform for enhancing research knowledge of R&D professionals of both collaborating partners may allow spillovers of involuntary know how to partners and thus incur higher cost than benefits that could actually be realized from knowledge sharing and learning process of development efforts. This, in turn, affects negatively the profitability (performance) of the focal firm. Another reason to this could probably because of the financial returns from the investments made on training and development activities had not yet realized in a short time (Wright, et al., 1999) thus lead to negative impact on the company's profitability. It is expected that R&D companies involved in collaboration with other companies tend to invest more money in training and development activities than their counterparts to ensure employees can perform effectively given the complexity of the work nature.

Collaborations in marketing have a non-significant relationship with organizational performance. The non-significance findings can be attributed to the lack of statistical power to detect a significant effect, due to the small sample size (Cohen 1988). The non-methodological aspect could be justified based on several reasons. *First*, most of the companies in this study are involved in applied or commercial based research, to serve their parent companies or specific customers. In this case, the parent companies or the customers will do the marketing activities for them. Hence, as shown in the findings, R&D companies in this study tend to engage less in collaborations for marketing activities, as compared to collaborations in other functional activities. Further, the non-significant effects of some of the collaboration strategy types on the HRM practices – organizational performance relationships

could be due to the size of the companies in the sample, which mostly (about 70%) are small, with their number of full-time employees not exceeding 50. Thus, sophisticated HRM systems might not have been fully developed to deal with strategic changes in those firm. As asserted by Ghebregiorgis and Karsten (2007), smaller companies are less likely to develop formal or sophisticated policies, rules and regulations that oversee their employment relationship than larger ones are. Accordingly, this informal or traditional system tends to deter a firm's efforts to create appropriate employee behavior, which can facilitate the firm in handling its business's strategic requirements, in achieving its utmost performance, as submitted in its behavioral perspective, which has its roots in the contingency theory (Pennings 1987).

*Second*, the non-significant findings of some moderating effects could probably be because R&D firms in Malaysia are too focused on implementing traditional administrative functions, such as practicing training and development and rewards, however, they fail to incorporate business perspectives in their process of managing their human resources (Ulrich 1998). In other words, they concentrate more on developing, changing and maintaining their internal practices, to enhance effectiveness, rather than putting in the effort to link the internal activities to the firm's strategic necessities. This is consistent with Rowley and Saaidah's (2007) findings which noted that the management of people in Malaysian locally owned companies had not shifted far from the "personnel" management approach towards the "human resource" management approach. According to Kaplan (1992), incorporating business perspectives is equally important for building the internal capability's effectiveness. In this regard, the failure to align HRM practices to either the



business's or firm's strategy makes it harder for firms to utilize their effective internal capabilities to deal with external pressures (e.g. intense competition, rapid technological change) which, in turn, hinder the possibility of realizing the desired financial outcomes (Ulrich 1998).

*Third*, another plausible explanation could be because these HR practices are not strategy sensitive, especially in a growing and immature sector such as the R&D sector in Malaysia, since firm survival is more important than competition. Unlike other sectors in Malaysia, including manufacturing and agriculture, the R&D sector has been given more serious attention in recent years. The Knowledge Based Economy Master Plan (KBEMP) is one of the major policy initiatives that recognizes the private sector's role in spearheading the knowledge economy through R&D efforts (KBEMP: Executive Summary, 2001-2010). This means that regardless of the strategy, the utilization of human resources, mainly through implementing certain HRM practices effectively, is more crucial to facilitate the enhancing of R&D organizations' performance, than trying to align the practice with the strategy that an organization wishes to follow, as assumed in a universalistic perspective underpinned by RBV (Barney 1991).

In order to perform in today's competitive environment, the performance of a R&D organization hinges upon its ability to successfully utilize its human resources to support implementing the organization's strategy. The multiplicity of challenges in the present environment have seen interfirm collaborative exercises being increasingly employed by many R&D firms to improve their performance and to simply survive. The benefits

of interfirm collaborations are well known in the literature, that includes allowing organizations to cope with rapid technological changes, to fulfill various customers' needs, to obtain marketing and manufacturing capabilities and to develop new capabilities. Therefore, of importance to an organization is to understand how its human resource can be managed to elicit the appropriate behavior so that interfirm collaborative efforts can be realized to their full potential and then enhance the R&D firm's performance.

Although some statistically significant results were observed, this study does not provide the statistical power to firmly dismiss the hypotheses that were not supported by our statistically significant results. Hence, the generalization should be taken cautiously, and future research is called for, to replicate these results with larger samples. Also, this study only investigates Malaysian R&D firms, and the choice of a single-industry tends to limit the generalizability of the findings. Future research can do the empirical work in different industrial contexts to generalize or modify the concepts understudied. Finally, the use of a single performance measure, particularly profitability, is likely to devalue the potential impact of HRM practices in facilitating companies to attain effectiveness through satisfying various stakeholders' concerns. Even though profitability is a good indicator to reflect a firm's performance, especially in attracting investment, this short term objective needs to be backed up with long term goals. Therefore, future research should also incorporate the non-financial measures that reflect various stakeholders' preferences, such as innovation, customer/partner satisfaction, and employee turnover in order to ensure the survival of the company in the industry.

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